

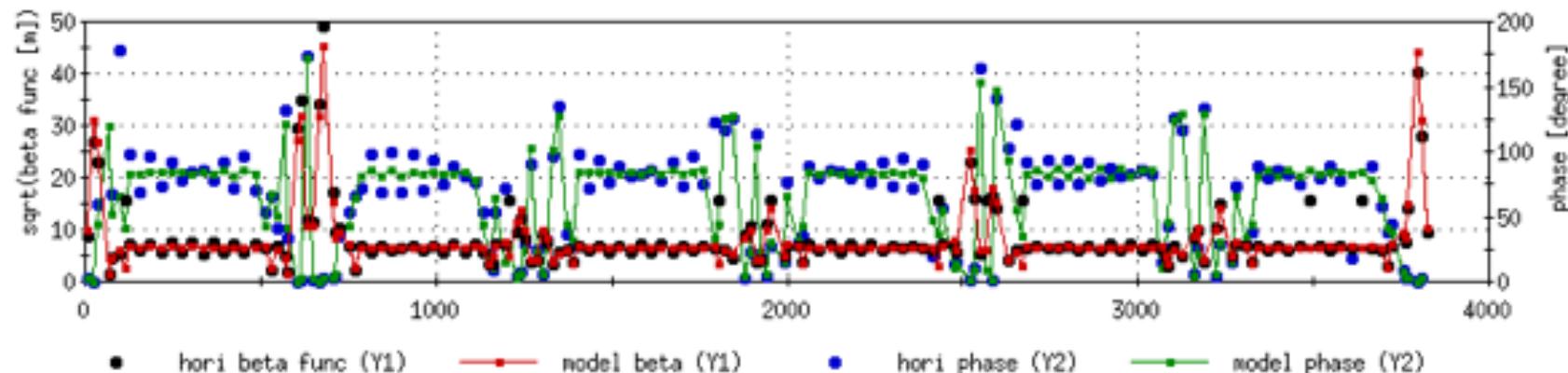
OpticsCorrection

Blue 255 GeV Optics Corrections and Measurement

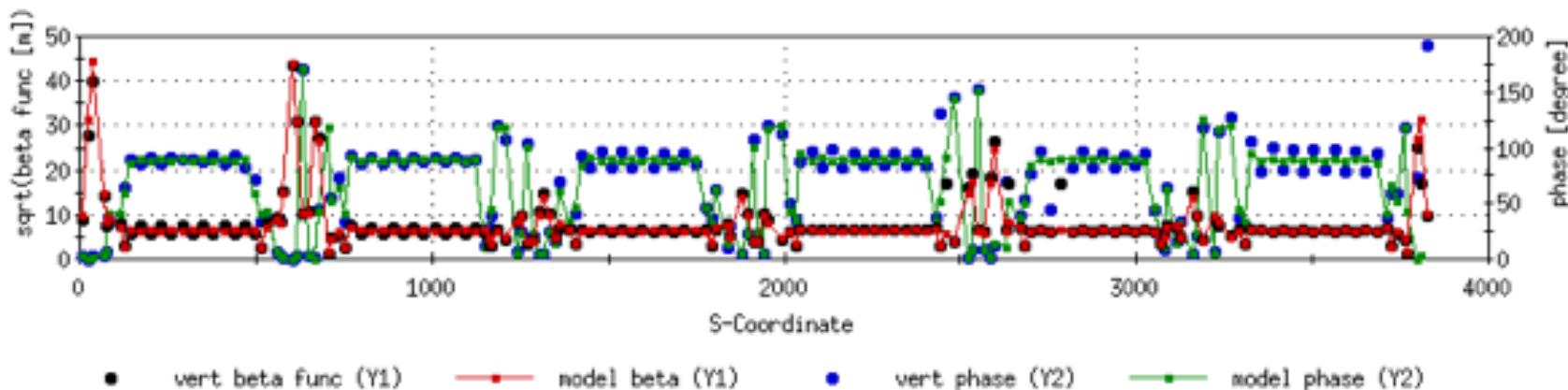
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C-A Dept., BNL

Measured Beta-Beat: Blue Basline

Optics Correction

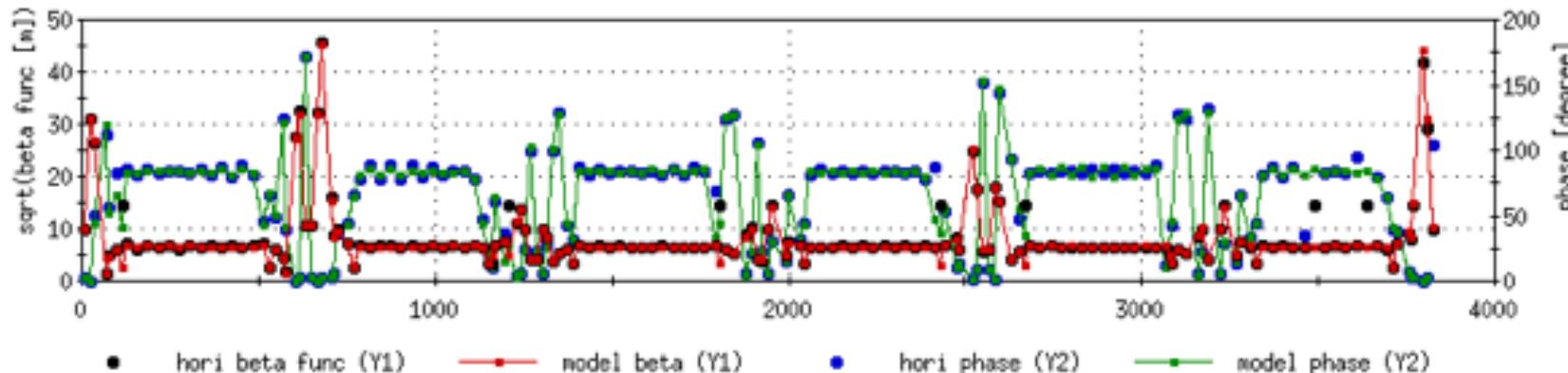


Lattice: Blue

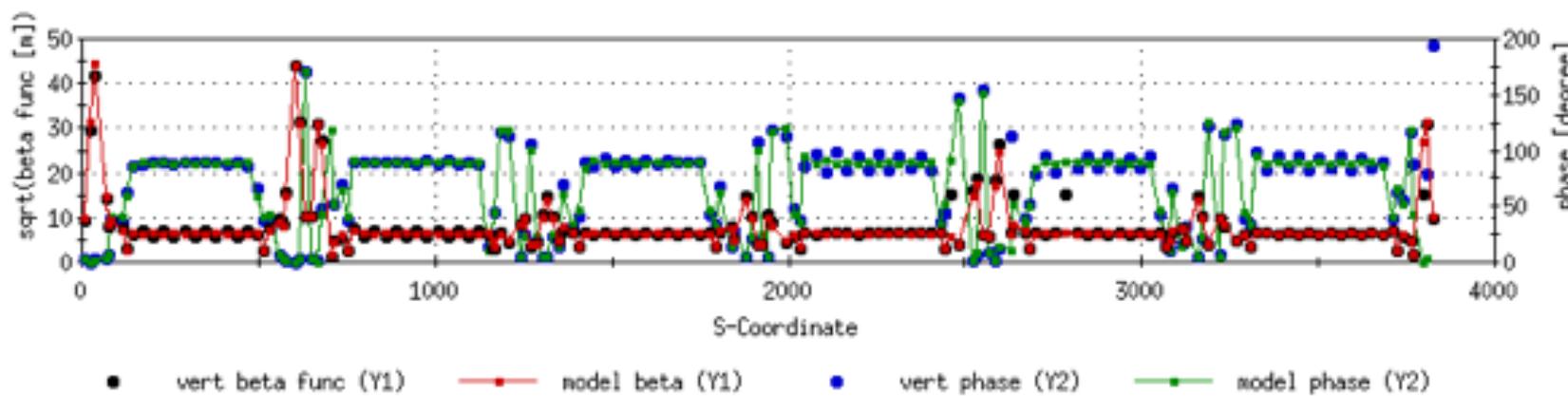
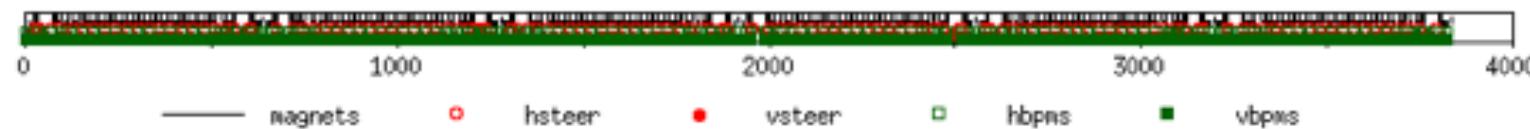


Measured Beta-Beat: Blue with corrections

Optics Correction



Lattice: Blue



Measured Beta*, Beta@IP, S*

Optics Correction

Baseline

Beta* at IPs						
	IP2	IP4	IP6	IP8	IP10	IP12
H_b*	2.37	6.41	0.83	0.52	8.89	5.54
H_bIP	2.366	6.449	0.957	0.539	8.911	5.545
H_s*	-0.05	-0.49	0.32	0.09	-0.41	-0.20
V_b*	1.83	7.65	0.74	0.67	6.56	6.19
V_bIP	1.854	7.662	0.797	0.667	6.595	6.193
V_s*	0.22	0.32	0.20	-0.03	-0.50	-0.07

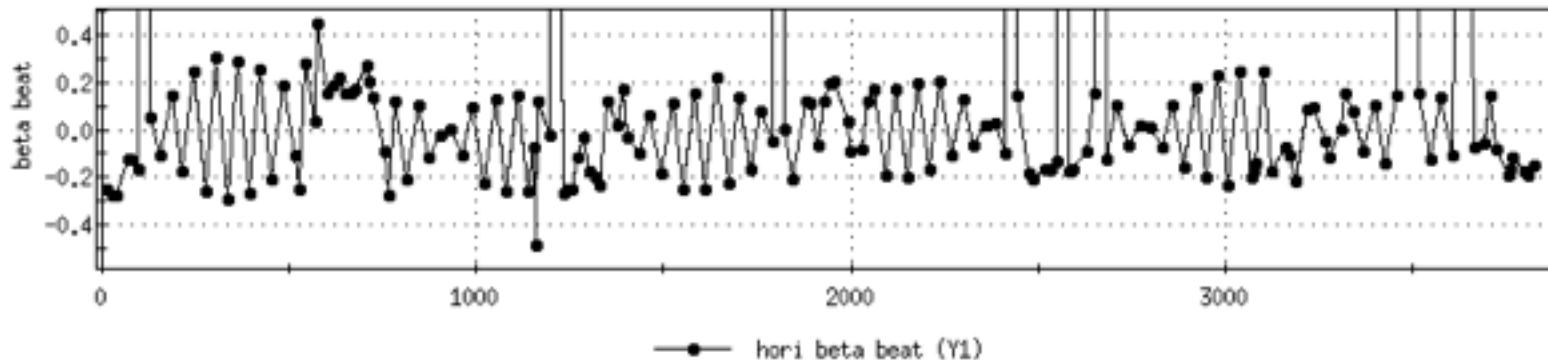
With corrections

Beta* at IPs						
	IP2	IP4	IP6	IP8	IP10	IP12
H_b*	2.00	6.79	0.69	0.59	7.00	6.29
H_bIP	2.015	6.791	0.778	0.592	7.001	6.298
H_s*	-0.15	0.02	-0.10	0.06	-0.11	0.18
V_b*	1.82	6.90	0.68	0.63	6.20	5.98
V_bIP	1.831	6.938	0.812	0.635	6.217	5.980
V_s*	0.16	0.48	0.05	0.07	-0.32	0.07

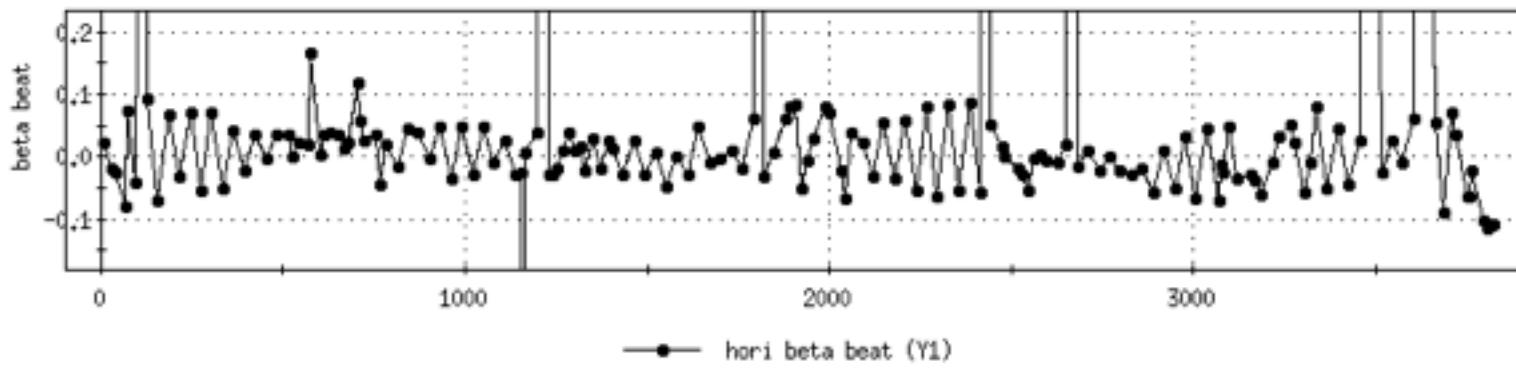
Measured Beta-Beat: Blue Horizontal

Optics Correction

Baseline



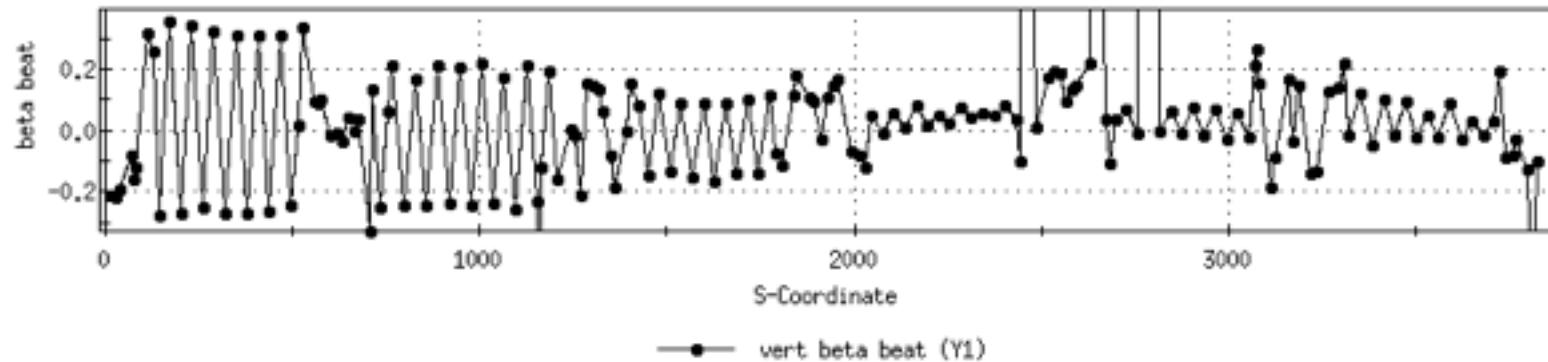
With corrections



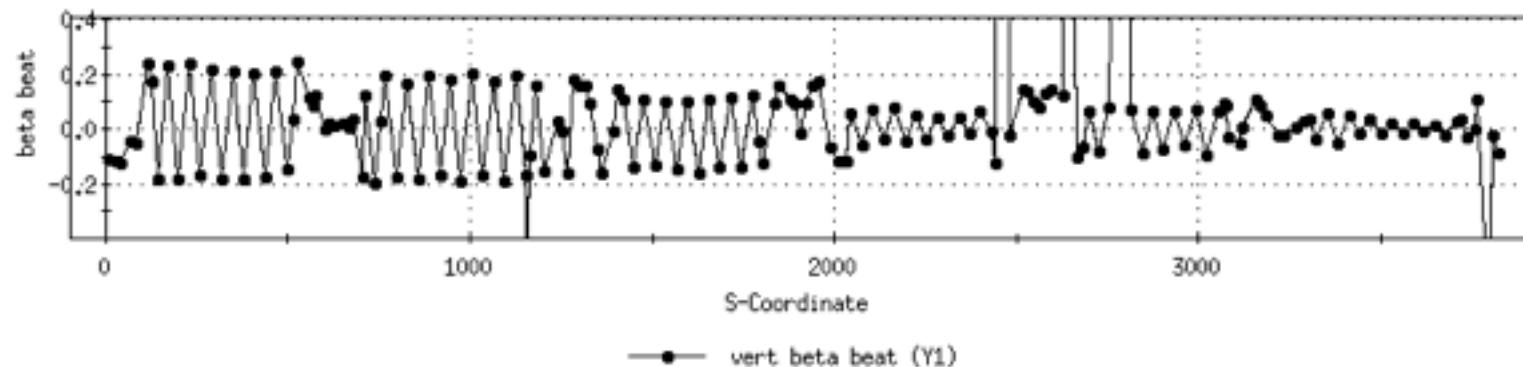
Measured Beta-Beat: Blue Vertical

Optics Correction

Baseline



With corrections



SBST Calculated Corrections

Optics Correction

```
bo11-tq5 -0.0002425
bo11-qf2 -0.00015155
bi12-qd2 -0.000150496

bo7-qf2 0.000095275
bi8-qd2 -0.000095275

bi1-qd2 -0.000133176
bo2-qf2 -0.000133176

bi9-qd2 -0.000150496

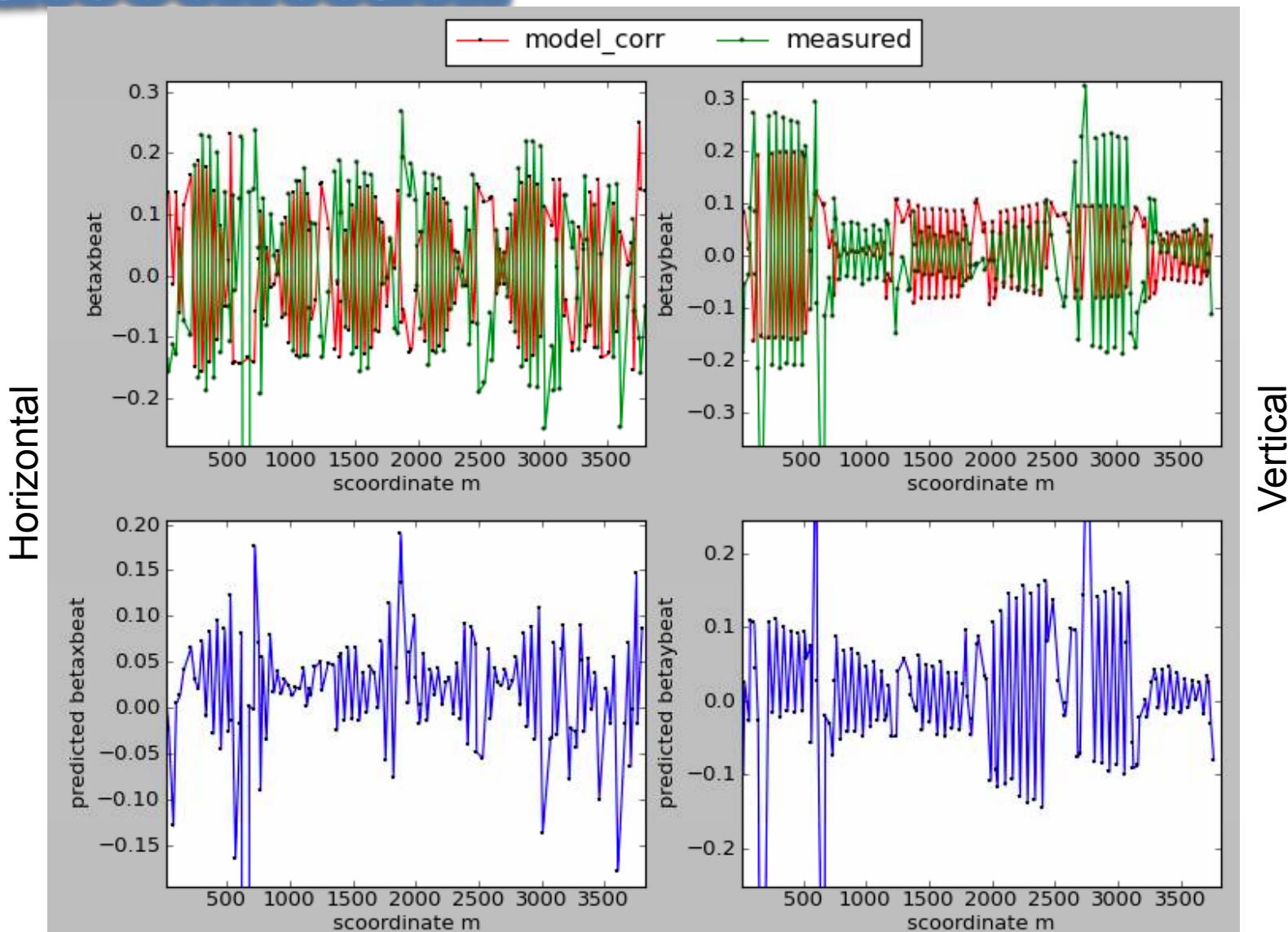
bi5-qd2 -0.00009525018
bo6-qf2 -0.00003811
```

Definition:

- Measured: beta-beat measured by using ac dipole technique
- model_corr: beta-beat from the corrections calculated by SBST
- predicted beta-beat: sum of measured beta beat and the beta beat from SBST corrections

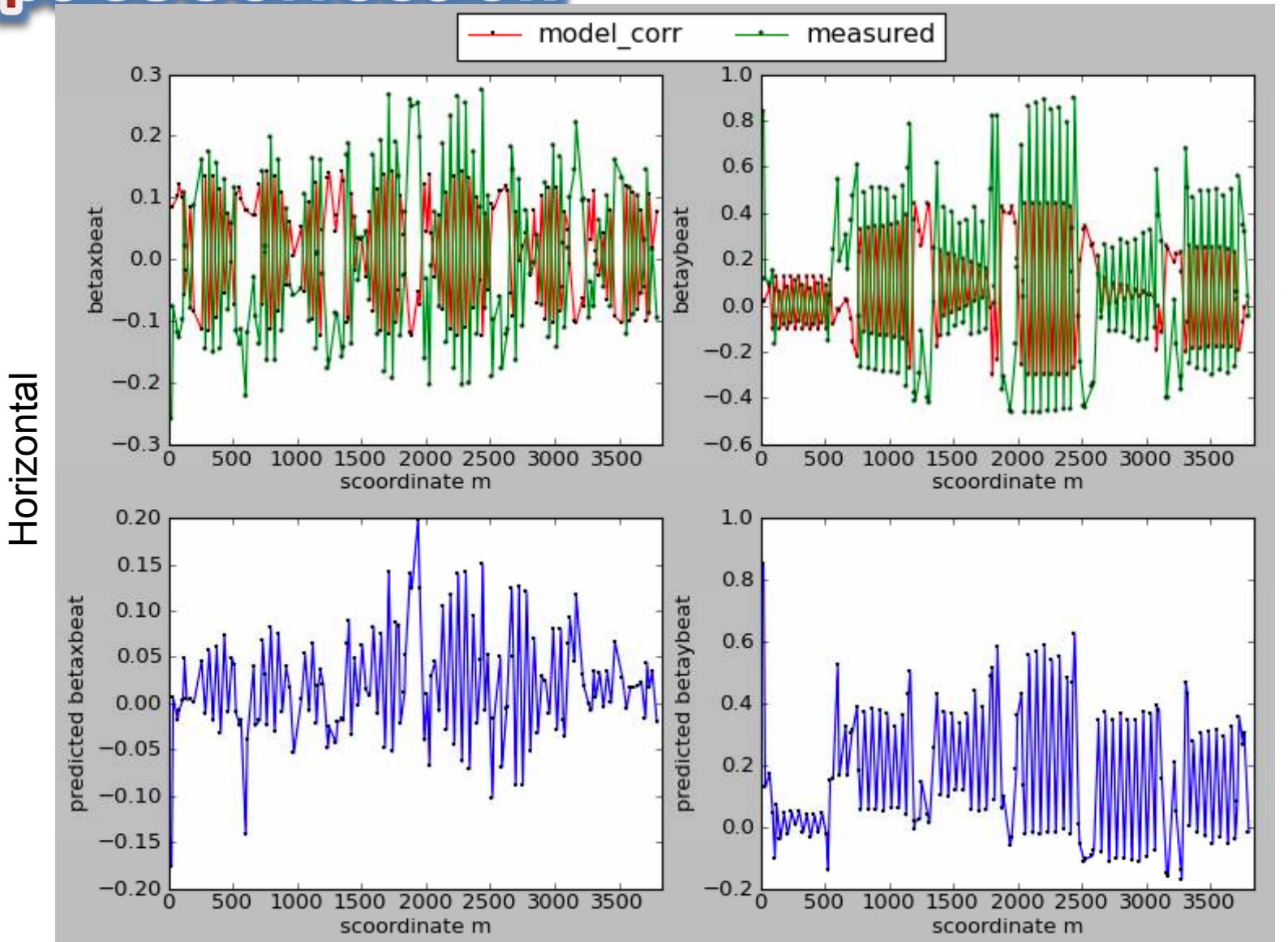
Measured and predicted beta-beat: Blue

OpticsCorrection



Measured Beta and Phase advance: Yellow

Optics Correction



Conclusion and Plan

Optics Correction

- Conclusions
 - Corrections from SBST analysis in Blue worked ☺
 - Needs more iterations
- Plan
 - For ion run, optics measurement and corrections
 - Correct the rest of the beta-beat with global correction
 - Code is under-development by GRD and Joe
 - Expect to be ready during ion run

Global Optics Correction

Optics Correction

- What is it?

$$\frac{\Delta\beta}{\beta} = -\frac{1}{2\sin(2\pi Q)} \sum_i^{nquad} \Delta k_i \beta_i \cos(2\pi Q + 2(\psi - \psi_i))$$

Phase advance

$$\left(\frac{\Delta\beta_j}{\beta_j} \right)_{nbpm} = (M)_{nbpm \times nquad} (\Delta k_i)_{nquad}$$
$$(\Delta k_i)_{nquad} = (M)^{-1}_{nbpm \times nquad} \left(\frac{\Delta\beta_j}{\beta_j} \right)_{nbpm}$$

- Calculate gradient deviation from the model
- Only work for small perturbation and assume the model is pretty close to reality
- Demonstrated proof-of-principle in RUN2009 ago with a dialed-in gradient error of one of the IR trim quads
- Briefly tested correction at injection with only IR trim quads. No conclusions due to limited data